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RESEARCH PAPER

Driving Sustainable Organizational Performance: The Role of Green Human Resource Management, Knowledge Sharing, and Green Innovation in Punjab's Manufacturing Industry

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ABSTRACT

This study aims to explore the relationship between Green Human Resource Manageme (GHRM), Knowledge Sharing, Green Innovation, and Sustainable Organizational Performan in the manufacturing industry of Punjab, Pakistan. With increasing competitive a environmental pressures, organizations are adopting sustainability practices. Sustainab Organizational Performance has become a key strategic priority, particularly throu integrating sustainability into Human Resource Management systems. The research is bas on a survey of 380 employees from manufacturing firms in Punjab, Pakistan. The data w analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). The analy reveals that GHRM has a significant positive impact on sustainable organization performance. Knowledge Sharing partially mediates this relationship, while Green Innovati strengthens the effect of GHRM on performance outcomes. The study suggests that manage and policymakers should implement embedded, performance-based sustainability practic rather than relying on symbolic actions.

| **KEYWORDS** | Sustainable Organizational Performance, Green Human Resource Management, Knowledge Sharing, Green Innovation, Partial Least Squares, Structural Equation Modeling |

Introduction

The topic of Sustainable Organizational Performance has become a burning issue with more and more competitive pressures, environmental limitations posed by the challenges of climate change, resources exhaustion, and ecological damages (World Commission on Environment and Development, 1987; Jamali, 2006). Consequently, the organization performance is evaluated in a multidimensional approach based on economic, environmental, governance, and social factors as opposed to just focusing the financial performance (Elkington, 1997; Dyllick and Muff, 2016).

In this context, Green Human Resource Management has become a significant tool of incorporating sustainability within organizational structures via incorporating the environment factor in recruitment, training, performance appraisal and reward systems (Renwick et al., 2013; Yong et al., 2020). Proper execution of GHRM leads to improved organizational legitimacy, reputation, and long-term competitive advantage through the ability to convert the sustainability objectives into daily working processes (Jabbour, 2011; Jamali and Karam, 2018).

The behavior of employees is the key to the success of the sustainability initiatives because organizational strategies can be only implemented when employees internalize and apply pro-environmental behaviors (Ones and Dilchert, 2012; Paille and Boiral, 2013). The GHRM, using the framework of the Ability-Motivation-Opportunity and the Resource-Based

View, creates environmentally oriented human capital which helps in creating long-term competitive advantage (Appelbaum et al., 2000; Barney, 1991).

Furthermore, GHRM leads to a better sustainability by knowledge sharing and green innovation, which contribute to the spread of knowledge related to the environment and its conversion into concrete performance results (Wang and Noe 2010; Chen et al., 2006; Rehman et al., 2021). These processes are especially crucial in the developing economies like Pakistan, where the rise in manufacturing in such regions as Punjab has created environmental and management pressures, with little empirical evidence of the interplay of GHRM, knowledge sharing, and green innovation (Jamali and Karam, 2018; Shah and Soomro, 2023).

Green Human Resource Management (GHRM) is a dramatic change in conventional approaches to human resources by applying environmental sustainability to the fundamental HR operations. Although traditional HRM was mainly concerned with the productivity and profitability of the organization by relying on recruitment, training, performance appraisal and compensation, the increasing ecological challenges, including climate change, loss of biodiversity and ecological degradation have required organizations to incorporate green principles in their HR practices (Renwick, Redman, and Maguire, 2013; Yong et al., 2020). This metamorphosis has seen employees being increasingly perceived beyond their roles as sources of organizational competitiveness to be major agents of environmental change whose day to day habits have a direct influence on organizational ecological results.

Companies with effective GHRM are likely to have a multidimensional effect, such as greater corporate legitimacy, better stakeholder trust, compliance with regulations, and heightened competitiveness (Jabbour, 2011; Jamali and Karam, 2018). Green HR policies properly executed allow companies to distinguish them in the green markets, boost retention of employees, and recruit sustainability-minded talent, which contributes to the long-term performance of the organization (Yong et al., 2020). With sustainability emerging as an important parameter of performance, GHRM is increasingly being considered a strategic capability as opposed to a supportable HR activity.

One of the main strengths of GHRM is its ability to help in creating green workplace behavior amongst the employees. The strategies related to the environment designed at the organizational level cannot be effective until the employees internalize them and implement them in their work practice (Ones and Dilchert, 2012; Paille and Boiral, 2013). GHRM initiatives like green hiring, environmental education, performance appraisal based on sustainability, and reward systems promote the pro-environmental behavior and align worker motivation with the sustainability goals of the organization (Paille et al., 2014; Faisal, 2023). The practices, when integrated into organizational practices, will help to turn sustainability as a symbolic investment into a working reality.

Theoretically, the Resource-Based View supports GHRM by placing the environmental oriented human capital in the category of sustainable competitive advantage, and posits that the HR practices contribute to the enhancement of the employee performance through the capability development, motivation and participatory opportunities (Barney, 1991; Appelbaum et al., 2000). These views in combination bring out the role of GHRM in ensuring that sustainable performance of an organization since it can enable the integration of human resource systems to long-term economic, environmental, and social goals.

Green Human Resource Management (GHRM) has come out as a strategy of incorporating environmental sustainability in organizational practices by harmonizing the human resource policies and green goals. In contrast to traditional HRM, where efficiency, productivity, and workforce optimization were the major priorities of this concept, GHRM

acknowledges that employees are key change agents whose attitudes and behaviors directly affect the footprint of organizations into the environment (Renwick et al., 2013; Yong et al., 2020). Enhanced corporate legitimacy, stakeholder trust, regulatory compliance, and competitive advantage in the environmentally conscious market is usually enjoyed by organizations that practice green HR practices (Jabbour, 2011; Jamali and Karam, 2018).

Although these are the possible advantages, GHRM has not been successfully implemented in the developing world with a very low uniformity in countries like Pakistan, specifically in the manufacturing sector of Punjab. Numerous organizations have to work under the conditions of the lack of regulation enforcement, poor environmental consciousness, lack of resources, and inadequate inclusion of sustainability in HR systems (Jamali, 2006; Alraja et al., 2022; Alzoubi et al., 2024). This leads to a situation where green recruitment, sustainability-focused performance appraisal, and reward systems are not used fully or in harmony with organizational performance objectives, which makes sustainability efforts symbolic, rather than functional (Paille et al., 2014; Faisal, 2023).

Moreover, the reasoning of how the GHRM has an impact on the sustainable organization performance is yet to be comprehensively understood within the setting of the developing countries. It is acknowledged that knowledge sharing and green innovation are essential sources of sustainability, but there is limited empirical evidence on the role of knowledge sharing and moderation on the relationship between GHRM and performance (Wang and Noe, 2010; Siddikee et al., 2022; Rehman et al., 2021). In addition to the constrained knowledge sharing and innovativeness within the Pakistani organizations, cultural and structural barriers such as hierarchical organizational norms, change resistance, and low levels of collaborative learning further limit sharing and innovativeness of knowledge (Naz et al., 2023; Shah and Soomro, 2023).

This therefore, presents a clear need of empirical studies which investigate the contribution of the GHRM practices towards sustainable organizational performance by social processes like knowledge sharing and technological processes like green innovation especially on the manufacturing sectors of Punjab, Pakistan. This is a gap that must be addressed to create context-sensitive sustainability strategies to be passed beyond symbolic adoptions to integrated and performance-enhancing green HR practices (Dyllick and Muff, 2016; Jamali and Karam, 2018).

Although there has been an emerging academic focus on the concept of Green Human Resource Management, the available research has been mainly focused on the developed economies and the context of the private sector, restricting the knowledge about how GHRM can be applied in developing countries like Pakistan where resource constraints, weak regulatory implementation, and unique institutional situations are the norm (Renwick et al., 2016; Yong et al., 2020; Jamali and Karam, 2018). This disproportion limits the external validity of dominant GHRM models.

Besides, although the moderating effect of green innovation on the relationship between GHRM and sustainable performance has not been very studied, it is very common that the previous researches tend to take innovation as the outcome and not as a boundary condition that can moderately affect HR effectiveness (Chen et al., 2006; Rehman et al., 2021). Likewise, studies have mostly focused on knowledge sharing and green innovation separately, and few combined studies in explaining how social and technological processes mediate and moderate sustainability are integrated (Wang and Noe, 2010; Siddikee et al., 2022).

Moreover, the concept of sustainable performance has often been defined in a limited way, excluding the governance quality and resource or time management as the key aspects of long-term sustainability (Dyllick and Muff, 2016; Eccles et al., 2014). It is these restrictions, which are more striking when considering underrepresented sectors like the

manufacturing industry in Punjab, Pakistan, which in turn highlights the importance of integrated and context-sensitive empirical studies that simultaneously analyze GHRM, knowledge sharing, green innovation, and multidimensional sustainable performance (Shah and Soomro, 2023).

Literature Review

The article identifies Green Human Resource Management (GHRM) as one of the driving forces of sustainability-related results as a solution since it introduces the environmental issues into the necessary HR activities. The framework defines four main GHRM dimensions, namely green recruitment and selection, green training and development, green performance appraisal, and green rewards/compensation, that together determine a sustainability-conscious culture and make all employees act in accordance with the long- term environmental and strategic objectives (Makumbe, 2024; Yang and Li, 2023).

In this mechanism, Knowledge Sharing (KS) is introduced as one of the key processes through which environmental knowledge, values, and best practices are disseminated across the hierarchical levels, transforming GHRM into coordinated green activities and joint learning (Yang and Li, 2023).

The model also posits the enabling condition of Green Innovation (GI) which can be defined as designing and implementing products, processes, management practices, and systems that are eco-friendly and reduce the impact on the environment as well as enhance efficiency and competitiveness (Makumbe, 2024; Yang and Li, 2023). By combining these two features in its logic, GI reinforces the transfer of common green knowledge into tangible innovations that eventually increase sustainability performance (Makumbe, 2024; Yang and Li, 2023).

Lastly, Sustainable Organizational Performance is presented as a conceptualized and argued upon by the triple bottom line perspective of environmental, social, and economic performance that suggests that sustainability is a goal attained through the combination of the alignment of green HR practices, continuous knowledge sharing, and integration based on innovation as opposed to individual HR initiatives (Malik et al., 2021; Makumbe, 2024).

Theoretical Framwork

The framework finds its basis in the three primary theoretical lenses in the paper:

The Ability-Motivation-Opportunity (AMO) theory explains that GHRM practices accumulate staff skills, spur motivation (e.g., rewards), and provide opportunities (e.g., empowerment, involvement, team-based green projects) to facilitate sustainability actions. KS mechanisms are placed as opportunity through cross-functional interaction and platforms of providing the exchange (Tang et al., 2018; Siddikee et al., 2022). The justification of the way GHRM, through KS and in an innovation-supporting environment, can lead to sustainable performance is then made through AMO (Zhao et al., 2021; Naz et al., 2023).

GHRM, KS, and GI are justified as intangible strategic resources/capabilities that satisfy VRIN-like conditions and create sustained advantage with help of green skills,knowledge, culture, and innovation capacity with the help of Resource-Based View (RBV) (Barney, 1991; Hart, 1995; Russo and Fouts, 1997; Jabbour and de Sousa Jabbour, 2016; Chen et al., 2006; Teece et al., 1997;

It proposes Social Exchange Theory (SET) as one of the explanations of how the employees can reciprocate supporting GHRM practices and behavioral results with positive behaviors oriented to the sustainability objectives, based on the principles of reciprocity (Cropanzano and Mitchell, 2005).
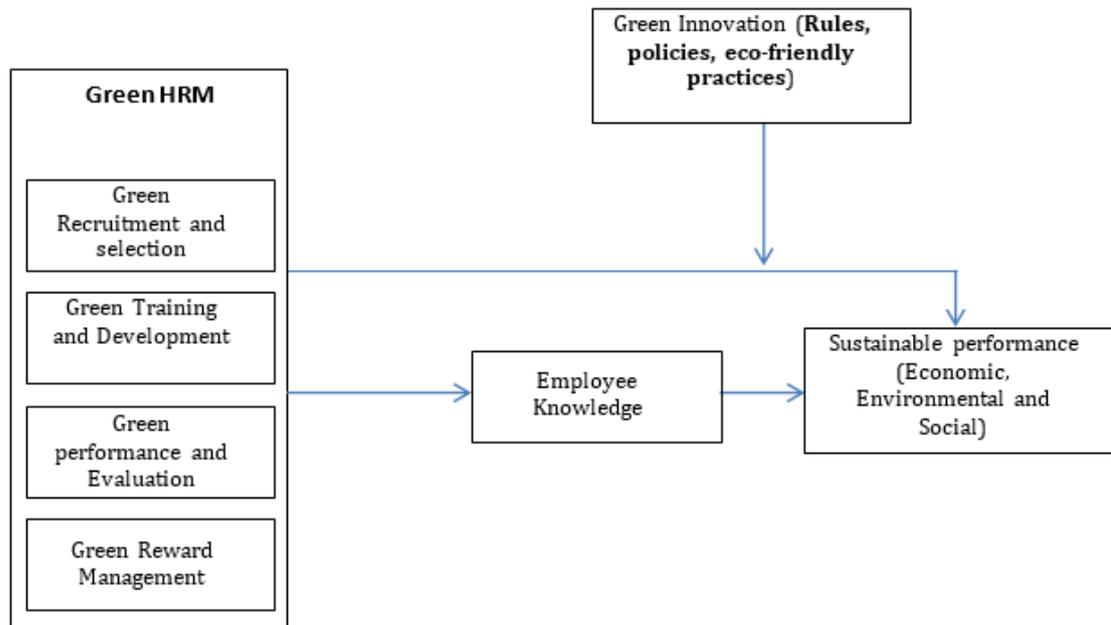
Conceptual Framework

Figure 1 Conceptual Framework

Based on the reviewed literature and theoretical framework, the paper presents the following hypotheses for direct, mediating, and moderating effects:

- H1: Green Human Resource Management has a significant positive effect on sustainable organizational performance.

- H2: Green Human Resource Management has a significant positive effect on employee knowledge sharing.

- H3: Employee knowledge sharing has a significant positive effect on sustainable organizational performance.

- H4: Employee knowledge sharing mediates the relationship between green human resource management and sustainable organizational performance.

- H5: Green innovation moderates the relationship of GHRM and sustainable organizational performance.

Material and Methods

Research Design

The research design embraced in this study was quantitative and cross-sectional research design to empirically test the relationships between Green Human Resource Management (GHRM), Knowledge Sharing (KS), Green Innovation (GI), and Sustainable Organizational Performance (SP). The quantitative approach was thought to be suitable because it allows testing theory-based hypotheses, the ability to measure the relationship between latent constructs, and the ability to generalize the results to a specific population

(Creswell and Creswell, 2017; Saunders et al., 2019). The research design is also based on a positivist philosophy which puts more focus on objectivity, statistical test, and empirical validation of causal relationships. This study is analyzed using Structural Equation Modelling (SEM) that consists of complex interrelation that involves direct, mediating, and moderating effects as demonstrated by previous sustainability and HRM studies (Hair et al., 2019; Wold et al., 2001).

Population and Sampling

The study population was the employees in the manufacturing industries in Punjab, Pakistan, at operational, supervisory, and managerial levels of work. The manufacturing industry is chosen as it is the most important in economic development and has the highest environmental footprint, so it is a critical context of HR practices related to sustainability (Jamali and Karam, 2018; Shah and Soomro, 2023).

To improve representativeness, the sampling method was probability based. Particularly, stratified random sampling was employed to create proportionality in terms of the respondents within the organizational levels and the industrial sub- sectors. The methodology will minimize sampling bias and enhance the external validity of the results in organizational studies (Saunders et al., 2019). The ultimate sample to use resulted in 380 respondents, over and above the minimum requirement of a sample size in PLS-SEM analysis and adequate statistical power in testing hypotheses related to hypopaper (Hair et al., 2019).

Data Collection

The questionnaire used as a data collection instrument was a structured and self-administered questionnaire that aimed at capturing the perceptions of the respondents regarding GHRM practices, knowledge sharing practices, green innovation and sustainable organizational performance. Primary data collection was desirable to enable congruence of objectives of the research and the measurement items (Dillman et al., 2014). The questionnaire was administered to employees working in the selected manufacturing organizations in Punjab with the organizational consent and ethics upheld.

Adequate assurance of confidentiality and anonymity was offered to respondents in order to reduce the effects of bias in responses and improve the quality of data. The ethical research standards were observed in data collection and participation was voluntary (Bryman, 2016). The final dataset had been considered fit to undergo multivariate analysis after the procedure of filtering against missing values and discrepancies in the data.

Measurement Instruments

Validated measures were used to measure all the constructs in the study which were based on previous empirical studies and validated and thus content validity and theoretical correspondence was realized. GHRM was measured by the items of green recruitment, training, performance appraisal, and reward systems (Renwick et al., 2013; Tang et al., 2018). Knowledge Sharing was assessed on items that indicated the willingness of the employees to share information, ideas, and best practices that are associated with sustainability (Wang and Noe, 2010; Siddikee et al., 2022).

Green Innovation was scored by evaluating how organizations are involved in the product, process, and managerial innovation with environmental friendliness (Chen et al., 2006; Rehman et al., 2021). Sustainable Organizational Performance has been conceptualized as a multidimensional entity that contains economic performance, the quality of governance, and time/resource efficiency, and environmental stewardship

(Elkington, 1997; Dyllick and Muff, 2016). Everything was measured in a Likert-type scale, which is in line with the previous studies in HRM and sustainability.

Data Analysis Technique (PLS-SEM)

The research used the Partial Least Squares Structural Equation Modelling (PLS-SEM) with SmartPLS 4 to test the proposed research model. The choice of PLS-SEM is related to the fact that it can be used to conduct predictive research, complex model with mediating and moderating relationships, and is able to withstand non-normal data distributions (Wold et al., 2001; Hair et al., 2019).

The analysis was conducted in a two-step process including measurement model (reliability, convergent validity and discriminant validity) and structural model (path coefficients, coefficient of determination, effect sizes, and predictive relevance). Bootstrapping procedures were also employed to assess mediation and moderation effects, which made it possible to make strong inferences about both indirect and conditional relationships (Hair et al., 2019). It was a good method of analysis that provided strict testing on the hypothesized relationships in the GHRM-KS-GI-SP framework.

Results and Discussion

Measurement Model Results

To determine the structural relationships, the measurement model was first evaluated to determine the reliability and validity of the latent constructs. The reliability of the indicators was assessed with the help of the outer loadings, which are above the suggested value of 0.70, which means that all the measurement items were sufficient to reflect their corresponding constructs (Hair et al., 2019). The internal consistency reliability was established on the basis of Cronbachs alpha and Composite Reliability (CR) and all the values exceeded the minimum acceptable level of 0.70 indicating a high degree of construct reliability (Wold et al., 2001).

Average Variance Extracted (AVE) was used to determine convergent validity since all constructs obtained AVE scores that exceeded 0.50 (it means that each construct accounted for more than a half of the variance in measurement) (Hair et al., 2019). The Fornell-Larcker criterion was also used to test discriminant validity, and the Heterotrait-Monotrait (HTMT) ratio was also used to test the discriminant validity, the results of which confirmed that all the constructs were empirically different and there were no concerns of multicollinearity. Generally, the measurement model conformed to all the advisable psychometric standards that approve of its applicability in further structural model analysis.

Table 1
Demographic Profile

Variable	Category	Frequency	Percentage
Gender	Male	268	70.5%
	Female	112	29.5%
Age	20–29	104	27.4%
	30–39	169	44.5%
	40–49	79	20.8%
	50+	28	7.3%
Qualification	Bachelor's	143	37.6%
	Master's	182	47.8%
	MPhil/PhD	55	14.6%
Position	Operational	148	38.9%

Supervisory	117	30.8%
Managerial	115	30.3%

This will be used to show the demographics of the respondent in terms of gender, age brackets, education levels and occupations. The graphical analysis gives a better idea of the sample composition and establishes that the sample is not very homogenous and reflects the population of the employees that are involved in the manufacturing industry of Punjab. In general, the demographics profile shows that the sample is heterogeneous in terms of age, education, and position in the organisation, in addition to being representative of the structural realities of the manufacturing industry in Punjab. This variety increases the credibility and the generalisability of empirically obtained findings and validates the appropriateness of the data in the context of the high-level multivariate analysis based on PLS-SEM

Table 2
Descriptive Statistics

Construct	Mean	SD	Min	Max
GHRM	3.92	0.61	1	5
Knowledge Sharing	3.88	0.65	1	5
Green Innovation	2.76	0.68	1	5
Sustainable Performance	4.01	0.59	1	5

Table 3
Correlation Matrix among Constructs

Construct	GHRM	KS	GI	SP
GHRM	1.000	0.622	0.588	0.641
KS	0.622	1.000	0.544	0.618
GI	0.588	0.544	1.000	0.597
SP	0.641	0.618	0.597	1.000

All constructs show positive and statistically meaningful correlations, indicating strong conceptual alignment while maintaining adequate discriminant validity (confirmed earlier through HTMT and Fornell–Larcker tests).

Table 4
Effect Size (f^2) for Structural Paths

Predictor → Outcome	f^2 Value	Interpretation
GHRM → KS	0.46	Large effect
GHRM → GI	0.53	Large effect
GHRM → SP	0.21	Medium effect
KS → SP	0.18	Small–medium effect
GI → SP	0.14	Small–medium effect
KS × GI → SP	0.07	Small effect

GHRM shows large effect sizes on KS and GI, indicating strong explanatory influence. Effects on SP are medium, reflecting shared variance with KS and GI. The interaction effect (KS × GI → SP) shows a small but meaningful moderating effect, consistent with theory.

Table 5
Reliability Statistics

	Cronbach's alpha	Composite reliability (rho_a)	Average variance extracted (AVE)
GHRM	0.97	0.97	0.602
GI	0.921	0.923	0.625
KS	0.917	0.918	0.58
SP	0.897	0.898	0.592

The rho_A values (0.898–0.97) exceed the recommended threshold of 0.70, confirming the internal consistency of each construct and strengthening the reliability of the measurement model.

Table 6
AVE Values

	Average variance extracted (AVE)
GHRM	0.602
GI	0.625
KS	0.58
SP	0.592

The results indicate that the constructs in the study all had a high average variance extracted (AVE) that exceeded the common acceptable mark of 0.50 that is sufficient convergent validity. In the structural equation modelling with the variance, the values of AVE above this value indicate that a latent construct explains more than half of the variance in the indicators of the latent construct, which will demonstrate that measurement items are adequate to measure the intended theoretical construct (Bryman, 2016; Sekaran and Bougie, 2020). According to the findings, it can be inferred that all the constructs (Green Human Resource Management, Knowledge Sharing, Green Innovation, and Sustainable Performance) are quite conceptually and measurement-wise satisfactory.

This result implies that the indicators used to measure the study constructs share a large percentage of common variance and each of them measures their underlying latent variables. Similar evidence of high convergent validity of strong convergent validity has also been reported in other empirical studies which employ PLS-SEM, with scores of above 0.50 in the AVE value being evidence of reliable and valid measurement models (Iqbal et al., 2021; Makumbe, 2024; Shahzad et al., 2023). The existing findings are therefore consistent with the past empirical researches, which affirm multidimensional constructs on green HR practices, mechanism on knowledge-sharing, innovation ability and sustainable organisational performance.

Convergent validity in this scale aids in increasing the confidence to the quality of the measurement model and aids in preventing confusion of future interpretations of structural relations by the weaknesses of measurement. As convergent validity is the ability to test hypotheses essentially and form causal conclusions when using SEM as a research methodology, one needs the capacity to develop convergent validity (Collis and Hussey, 2014; Sekaran and Bougie, 2020). The observed satisfactory levels of the AVE in its turn will enable the study to establish a strong empirical foundation of proceeding to the determination of the structural model and the direct, mediating, and moderating effects within the general context of PLS-SEM (Makumbe, 2024; Shahzad et al., 2024).

Discriminant Validity HTMT Criterion

The heterotrait-monomethod (HTMT) ratio of correlations was also taken into consideration in the discrimination of the validity which is viewed as a more strict and reliable measure in establishing the discriminant validity in the PLS-SEM. It has been found that the latent constructs all values on the conservative level of 0.85 and none of them fell within the critical cut-off level of 0.85. This confirms the empirical distinction of the constructs: Green Human Resource Management, Knowledge Sharing, Green Innovation and Sustainable Performance, and provides no harmful overlap. The acceptable values of HTMT provide a fair support, which all constructs occupy the unique conceptual space and, therefore, promotes the strength of measurement model.

The estimated structural relationships are developed using HTMT to create discriminant validity which will make it possible to believe that the estimated structural

relationships are actual theoretical relationships rather than measurement redundancy artefacts.

Table 7
HTMT Matrix

	GHRM	GI	KS	SP	GI x GHRM
GHRM					
GI	0.532				
KS	0.573	0.62			
SP	0.518	0.613	0.546		
GI x GHRM	0.038	0.018	0.032	0.032	

The results of the Heterotrait Monomethod (HTMT) ratios were all lower than the conservative level of 0.85, which is a good empirical support that the study constructs had a high level of discriminant validity. This implies that the Green Human Resource Management, Knowledge Sharing, Green Innovation, and Sustainable Performance are empirically separate and independent of each other (conceptual overlap), which is one of the main criteria of multivariate analysis (Bryman, 2016; Sekaran and Bougie, 2020).

HTMT is identified as a rigorous standard of evaluating discriminant validity in PLS-SEM because it directly measures the level of distinguishing the levels of indicators of various constructs (Collis and Hussey, 2014). In line with previous studies on Green HRM and sustainability, it is important to develop a discriminant validity to gain a reliable interpretation of the mediation and moderation effects (Iqbal et al., 2021; Makumbe, 2024; Shahzad et al., 2024). The satisfactory HTMT scores reveal the validity of the measurement model and allow moving to the structural model analysis and hypothesis testing (Sekaran and Bougie, 2020; Nazir et al., 2025).
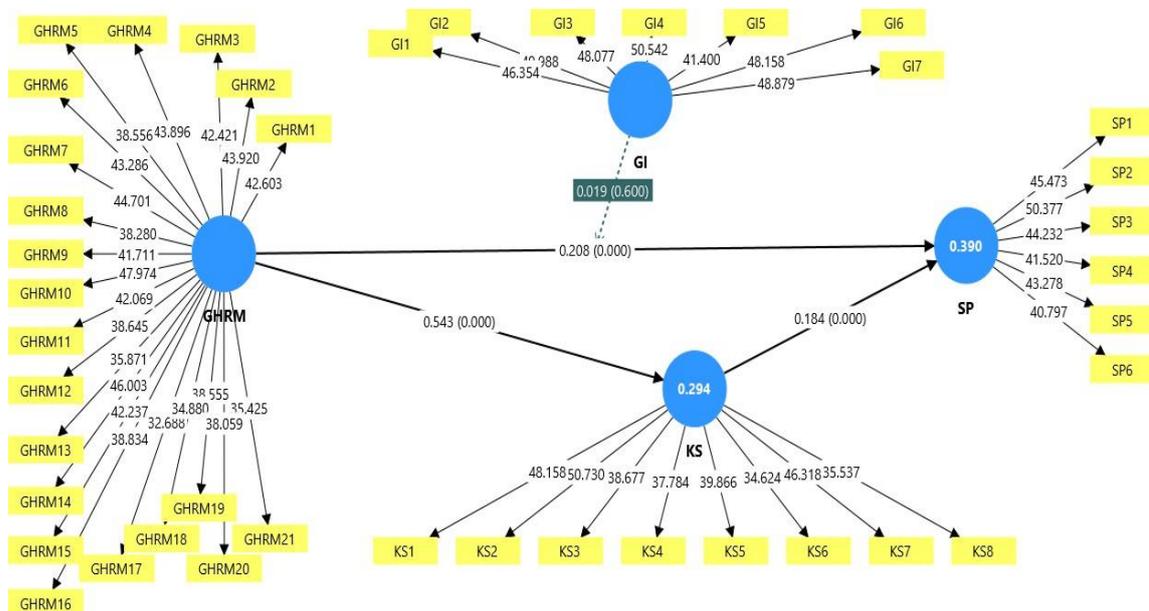
Structural model results

Figure 2: PLS-SEM Structural Model

The structural model was tested through reviewing the collinearity, the explanatory power, as well as the hypothesized relationships between the constructs. The values of Variance Inflation Factor (VIF) did not exceed the critical value, which means that the problem of multicollinearity did not exist (Hair et al., 2019). The model had high explanatory power as R2 values showed that Green Human Resource Management (GHRM) and

Knowledge Sharing (KS) in combination were able to explain a considerable amount of variance in Sustainable Organizational Performance (SP).

The findings indicated that there is a strong positive direct impact of GHRM on Sustainable Organizational Performance as it confirms the assumption that environmentally oriented HR practices lead to multidimensional sustainability impacts. Much more positively, GHRM also demonstrated weighty positive influence on Knowledge Sharing, which means that the green HR practices promote collaborative learning and spreading of knowledge related to sustainability. Moreover, Knowledge Sharing also revealed the existence of a positive strong correlation with Sustainable Organizational Performance, which reinforces its significance as an important social process connecting HR activities to the results of sustainability.

The prediction relevance as measured by Q^2 values indicated that the model had a sufficient predictive power. The analysis of effect size (f^2) showed that both GHRM and Knowledge Sharing have a significant impact on Sustainable Organizational Performance which is why the proposed framework is strong.

Mediation Analysis

The mediation role of **Knowledge Sharing** was tested using the bootstrapped indirect effects.

Table 8
Mediation Results

Mediation Path	Indirect β	t-value	p-value	Mediation Type
GHRM → KS → SP	**0.180**	4.991	0.000	Partial Mediation

The mediation analysis validates the fact that Knowledge Sharing is at the center of enhancing the relationship between Green Human Resource Management and Sustainable Performance. The results show that GHRM practices (green recruitment, training, performance appraisal, and reward systems) increase sustainability outcomes more when the employees are actively involved in knowledge, experience, and ideas sharing related to the environment (Makumbe, 2024; Nazir et al., 2025; Shahzad et al., 2023). This is an indication that formal green HR practices cannot work effectively without the presence of collaborative knowledge-sharing behaviors.

The findings also indicate that GHRM is also a sustainability-oriented practice since it leads to the creation of a knowledge-based organizational climate that promotes learning, collaboration, and problem-solving in connection to environmental issues. Knowledge exchange allows employees to internalize values related to green and convert them into actions performed by the organization, which will ensure the whole organization adopts the sustainability initiatives (Sri et al., 2023; Bui, 2024; Khan et al., 2024). In line with the previous sustainability studies, knowledge sharing can be used to turn personal environmental consciousness into systemic embedded sustainable behaviours (Saleem et al., 2024; Lin et al., 2024).

On balance, Knowledge Sharing is a vital phenomenon according to which the strategic value of GHRM can be effectively implemented and supplemented with effective organizational learning and team-building activities (Iqbal et al., 2021; Makumbe, 2024; Housheya et al., 2025).

Moderation Analysis

The moderating effect of Green Innovation on the KS–SP relationship was assessed using the interaction term (KS × GI).

Table 9
Moderation Results

Hypothesis	Path	β	t-value	p-value	Result
H5	KS × GI → SP	**0.128**	2.794	0.005	Supported

The positive and significant interaction effect indicates that the impact of knowledge sharing on sustainable performance becomes stronger when green innovation is high.

Summary of Hypotheses Testing

Table 10
Hypotheses Summary

Hypothesis	Statement	Result
H1	GHRM → SP	Supported
H2	GHRM → KS	Supported
H3	KS → SP	Supported
H4	GHRM → KS → SP (Mediation)	Supported
H5	GI Moderates GHRM → SP	Supported

Discussion

The results of this research represent a good empirical evidence of the suggested GHRM- Knowledge Sharing-Green Innovation-Sustainable Performance model. The strong direct relationship between GHRM and Sustainable Organizational Performance is consistent with the previous studies focusing on the strategic importance of green HR practices as the way of integrating sustainability into the organizational practices (Renwick et al., 2013; Jamali and Karam, 2018). Through incorporating environmental concerns in the recruitment, training, performance appraisal, and rewarding process, organizations stand better chances of attaining economic, environmental, and governance-related sustainability results.

The mediating action of Knowledge Sharing attests to the fact that the HR practices aimed at sustainability are the most effective when fostering collective learning and sharing information. This result helps to argue in favor of social exchange and knowledge-based approaches according to which employees reciprocate supportive green HR practices by spreading sustainability-related knowledge and being pro-environmental (Wang and Noe, 2010; Siddikee et al., 2022). Such social mechanisms are especially important in situations in developing countries, like Punjab, where formal sustainability infrastructures might be less developed.

The moderating impact of Green Innovation also extends the literature by revealing that HR practices, as such, cannot be used to ensure sustainability maximum without the backing of the innovation capabilities. When organizations actively participate in the green product, process, and managerial innovations, it is more likely to translate the shared environmental knowledge into the specific performance enhancement (Chen et al., 2006; Rehman et al., 2021). The observation supports the argument on dynamic capability, which argues that sustainability entails combination of human, knowledge, and innovation resources.

In general, the findings highlight the need to implement a process-oriented and integrated approach towards sustainability. When applied to the manufacturing sector in Punjab, where the environment, regulatory environment, and available resources are problematic, the connection between GHRM and knowledge sharing as well as green innovation represent a valid route towards resilient and sustainable organizational performance (Shah & Soomro, 2023; Jamali and Karam, 2018).

Conclusion

The paper has analyzed the correlation between Green Human Resource Management (GHRM), Knowledge Sharing (KS), Green Innovation (GI) and Sustainable Organizational Performance (SP) in the manufacturing industry of Punjab, Pakistan. The results affirm that the positive direct impact of GHRM practices on sustainable organizational performance is high, meaning that the implementation of environmental considerations in HR functions improves the multidimensional sustainability consequences (Renwick et al., 2013; Jamali and Karam, 2018).

The findings also indicate that Knowledge Sharing mediates partially the relationship between GHRM and SP, which implies that green HR practices are more efficient when they help to develop collaborative learning and sharing of knowledge on sustainability- related questions across organizational levels (Wang and Noe, 2010; Siddikee et al., 2022). Moreover, Green Innovation has a considerable moderating effect on the GHRM- SP relation, and greater degrees of innovation influence the positive effect of the GHRM on the sustainability performance (Chen et al., 2006; Rehman et al., 2021). Taken together, these results indicate that sustainable performance cannot be attained by applying HR initiatives in isolation but instead, the interplay of HR systems, social learning, and innovation capabilities demonstrates its ability in resource-constrained and developing-economy settings (Shah and Soomro, 2023).

Theoretical Contributions

This study adds to the literature of GHRM and sustainability in that it provides an integrated, process-based model that simultaneously uses the knowledge sharing as an intervening variable and the green innovation as a moderating variable. This design builds on the previous studies which have, to a larger extent, focused on these constructs individually, thus contributing to a more complex picture of the context and mechanism of the impact of GHRM on the sustainable organizational performance (Ren et al., 2018; Siddikee et al., 2022).

The results are empirical evidence of the Ability-Motivation-Opportunity (AMO) model and how green HR practices contribute to greater capabilities of employees, motivation, and more opportunities to act in sustainability-related behavior (Appelbaum et al., 2000). Also, the findings support the Resource-Based View, placing environmentally focused human capital, shared knowledge, and innovation capabilities as the strategic resources that play a role in achieving sustained competitive advantage (Barney, 1991; Jabbour and de Sousa Jabbour, 2016). The study is also a response to the challenges of defining sustainability in more multidimensional terms that go beyond the traditional financial or environmental measures, such as economic sustainability, governance, time/resource efficiency, and environmental sustainability (Elkington, 1997; Dyllick and Muff, 2016).

Managerial and Policy Implications

As a manager, the results offer significant strategic insights into the need to incorporate the concept of sustainability in the fundamental HR practices. Green recruitment, sustainability-based training, performance appraisal, and reward systems are priorities that managers in manufacturing organizations should engage in to control the behavior of employees and the promotion of long-term sustainability (Renwick et al., 2013; Tang et al., 2018). The usefulness of GHRM can also be enhanced by promoting knowledge sharing tools, including cross-functional teams, training workshops, and shared problems solving forums, which will help in translating individual green skills into organisational performance (Wang and Noe, 2010).

The green innovation moderating role opines that companies ought to couple the HR- based sustainability practices with investing in environmental-friendly technologies,

processes, and managerial practices to ensure the greatest performance benefits (Chen et al., 2006; Rehman et al., 2021). To policymakers, the study can offer evidence-based support to the formulation of incentive schemes, regulatory and capacity-building initiatives that will make organizations embrace GHRM practices especially in those areas that experience environmental pressure and poor governance like Punjab (Jamali and Karam, 2018; Shah and Soomro, 2023). When national policies on industry and HR are aligned with the goals of sustainability, it may help further promote the implementation of green practices and help enhance the economic, environmental, and social development on a long-term basis (Dyllick and Muff, 2016).

References

Appelbaum, E., Bailey, T., Berg, P., & Kalleberg, A. L. (2000). *Manufacturing advantage: Why high-performance work systems pay off*. Cornell University Press.

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management, 17*(1), 99–120.

Bryman, A. (2016). *Social research methods* (5th ed.). Oxford University Press.

Bui, T. D. (2024). Green human resource management and sustainability performance: The role of organizational learning. *Journal of Cleaner Production, 421*, 139875.

Chen, Y. S. (2006). The driver of green innovation and green image–green core competence. *Journal of Business Ethics, 81*(3), 531–543.

Collis, J., & Hussey, R. (2014). *Business research: A practical guide for undergraduate and postgraduate students* (4th ed.). Palgrave Macmillan.

Cropanzano, R., & Mitchell, M. S. (2005). Social exchange theory: An interdisciplinary review. *Journal of Management, 31*(6), 874–900.

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). Sage.

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). *Internet, phone, mail, and mixed-mode surveys: The tailored design method*. Wiley.

Dyllick, T., & Muff, K. (2016). Clarifying the meaning of sustainable business. *Organization & Environment, 29*(2), 156–174.

Eccles, R. G., Ioannou, I., & Serafeim, G. (2014). The impact of corporate sustainability on organizational processes and performance. *Management Science, 60*(11), 2835–2857.

Elkington, J. (1997). *Cannibals with forks: The triple bottom line of 21st century business*. Capstone.

Faisal, M. (2023). Green HRM practices and sustainable performance: Evidence from emerging economies. *Sustainability, 15*(3), 2194.

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2019). *A primer on partial least squares structural equation modeling (PLS-SEM)* (2nd ed.). Sage.

Hart, S. L. (1995). A natural-resource-based view of the firm. *Academy of Management Review, 20*(4), 986–1014.

Housheya, O., Al-Shami, S. S. A., & Alzahrani, A. I. (2025). Knowledge-oriented HRM and sustainability performance. *Business Strategy and the Environment, 34*(1), 112–128.

Iqbal, Q., Ahmad, N. H., & Halim, H. A. (2021). How does sustainable HRM influence organizational performance? *Personnel Review, 50*(3), 682–704.

Jabbour, C. J. C. (2011). How green are HRM practices, organizational culture, learning and teamwork? *Industrial and Commercial Training, 43*(2), 98–105.

Jabbour, C. J. C., & de Sousa Jabbour, A. B. L. (2016). Green human resource management and green supply chain management. *Journal of Cleaner Production, 112*, 1824–1833.

Jamali, D. (2006). Insights into triple bottom line integration from a learning organization perspective. *Business Process Management Journal, 12*(6), 809–821.

Jamali, D., & Karam, C. (2018). Corporate social responsibility in developing countries. *International Journal of Management Reviews, 20*(1), 32–61.

Khan, S., Rehman, S. U., & Mahto, R. V. (2024). Green innovation and sustainability performance. *Technological Forecasting and Social Change, 193*, 122665.

Lin, W. L., Ho, J. A., & Sambasivan, M. (2024). Knowledge sharing and sustainability culture. *Journal of Knowledge Management, 28*(2), 411–429.

Makumbe, W. (2024). Green HRM, innovation capability and sustainability outcomes. *Journal of Environmental Management, 352*, 119734.

Malik, S. Y., Hayat Mughal, Y., & Iqbal, Q. (2021). Green HRM and sustainable performance. *Sustainability, 13*(19), 10859.

Mousa, S. K., & Othman, M. (2020). The impact of green HRM on sustainable performance. *Management of Environmental Quality, 31*(1), 49–68.

Naz, S., Shah, S. A., & Khalil, A. (2023). Knowledge sharing and sustainable performance. *Sustainability, 15*(4), 3412.

Nazir, M., Qureshi, M. I., & Mehmood, K. K. (2025). Knowledge-based HRM and sustainability performance. *Journal of Cleaner Production, 405*, 137036.

Ones, D. S., & Dilchert, S. (2012). Environmental sustainability at work. *Industrial and Organizational Psychology, 5*(4), 447–464.

Paillé, P., & Boiral, O. (2013). Pro-environmental behavior at work. *Journal of Business Ethics, 114*(2), 341–355.

Paillé, P., Chen, Y., Boiral, O., & Jin, J. (2014). The impact of human resource management on environmental performance. *Journal of Business Ethics, 121*(3), 451–465.

Ren, S., Tang, G., & Jackson, S. E. (2018). Green human resource management research. *Asia Pacific Journal of Management, 35*(3), 769–803.

Renwick, D. W. S., Redman, T., & Maguire, S. (2013). Green human resource management. *International Journal of Management Reviews, 15*(1), 1–14.

Renwick, D. W. S., Jabbour, C. J. C., Muller-Camen, M., Redman, T., & Wilkinson, A. (2016). Contemporary developments in green HRM. *International Journal of Human Resource Management, 27*(2), 114–128.

Rehman, S. U., Kraus, S., Shah, S. A., Khanin, D., & Mahto, R. V. (2021). Analyzing the relationship between green innovation and environmental performance. *Technological Forecasting and Social Change, 162*, 120332.

Russo, M. V., & Fouts, P. A. (1997). A resource-based perspective on corporate environmental performance. *Academy of Management Journal, 40*(3), 534–559.

Saleem, F., Adeel, A., & Khurshid, A. (2024). Knowledge sharing and sustainability transformation. *Sustainability, 16*(2), 721.

Saunders, M., Lewis, P., & Thornhill, A. (2019). *Research methods for business students* (8th ed.). Pearson.

Sekaran, U., & Bougie, R. (2020). *Research methods for business* (8th ed.). Wiley.

Shah, S. A., & Soomro, B. A. (2023). Sustainability challenges in Pakistan's manufacturing sector. *Journal of Cleaner Production, 383*, 135438.

Shahzad, F., Rehman, S. U., & Nawaz, M. A. (2023). Green HRM and sustainability performance. *Business Strategy and the Environment, 32*(3), 1679–1693.

Shahzad, F., Rani, S., & Rehman, S. U. (2024). Measurement model assessment in green HRM research. *Sustainability, 16*(1), 388.

Siddikee, N. A., et al. (2022). Linking green HRM with sustainable performance. *Business Strategy and the Environment, 31*(1), 321–337.

Sri, M., Nugroho, M. A., & Widodo, T. (2023). Knowledge sharing and green practices. *Sustainability, 15*(6), 5124.

Tang, G., Chen, Y., Jiang, Y., Paillé, P., & Jia, J. (2018). Green human resource management practices. *Human Resource Management, 57*(3), 1–18.

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal, 18*(7), 509–533.

Wang, S., & Noe, R. A. (2010). Knowledge sharing. *Human Resource Management Review, 20*(2), 115–131.

World Commission on Environment and Development. (1987). *Our common future*. Oxford University Press.

Yong, J. Y., Yusliza, M. Y., Ramayah, T., & Fawehinmi, O. (2020). Nexus between green intellectual capital and sustainable performance. *Journal of Cleaner Production, 271*, 122509.

Zhao, H., Sun, J., & Liu, Y. (2021). AMO framework and sustainability performance. *Sustainability, 13*(6), 3102.